NEW SCHEME

ELN15/25

USN 1 M S 0 4 E C 0 8 8

First/Second Semester B.E Degree Examination, February/March 2005

Common to All Branches

Basic Electronics

Time: 3 hrs.] [Max.Marks : 100

Note: *1. Answer any FIVE full questions.*
2. All questions carry equal marks.
3. Assume missing data if any suitably.

1. (a) Explain the mechanism of conduction in semiconductors due to electrons & holes. **(6 Marks)**

(b) Derive an expression for conductivity in a semi-conductor in terms of electron and hole concentrations. **(8 Marks)**

(c) Estimate the value of resistivity of intrinsic Germanium at $300^0 K$ given :

Intrinsic concentration	=	$2.5 \times 10^{13} cm^{-3}$
Electron mobility	=	$3800 cm^2 \mid V - s$
Hole mobility	=	$1800 cm^2 \mid V - s$
Electron charge	=	$1.6 \times 10^{-19} C$.

(6 Marks)

2. (a) With a neat sketch explain the phenomenon of HALL-EFFECT in semiconductors. **(6 Marks)**

(b) A germanium diode is used in a rectifier circuit & is operating at a temperature of $25^0 C$ with a reverse saturation current of $1000 \mu A$. Calculate the value of forward current if it is forward biased by 0.22V. Assume the value of $\eta = 1$ for Ge. **(8 Marks)**

(c) With a neat figures clearly explain the concepts of Zener and avalanche breakdown phenomena. **(6 Marks)**

3. (a) With a neat sketch, clearly show the various current components in a PNP transistor and hence establish the relevant equations. **(10 Marks)**

(b) A bridge rectifier is driving a load resistance of 100Ω. It is driven by a source voltage of $230V, 50Hz$. Neglecting diode resistances. Calculate : **(6 Marks)**

i) Average DC voltage

ii) Average Direct current

iii) frequency of output wave form.

(c) Define α (Alpha) and β (Beta) of a transistor. **(4 Marks)**

Contd.... 2

4. (a) Clearly explain the effect of temperature and β on the operating point stability. **(8 Marks)**

(b) A transistor amplifier is driven by an input voltage of 10mV. The amplifier has a voltage gain of 60dB. Estimate the value of output voltage. **(6 Marks)**

(c) Explain the need for cascading of amplifier. Write an expression for total voltage gain of a cascaded amplifier. **(6 Marks)**

5. (a) What is Bark Hausen criterion for oscillations? **(6 Marks)**

(b) Design the value of an inductor to be used in a Colpitts oscillator to generate a frequency of 10MHz. The circuit is using a value of

$$C_1 = 100pF \ \& \ C_2 = 50pF.$$ **(6 Marks)**

(c) Listout the properties of an ideal Opamp and with the circuit symbol explain the significance of inverting & non inverting inputs. **(8 Marks)**

6. (a) Show with a derivation and circuit diagram, how an opamp can be used as an integrator. **(6 Marks)**

(b) An opamp is used as an inverting amplifier to amplify an input sine wave of amplitude 100mV(peak to peak). The input resistance $R_1 = 1K\Omega$ and feed back resistance $R_f = 10k\Omega$. Calculate the voltage gain and sketch the output wave form to scale. **(8 Marks)**

(c) Compare the performance of AM & FM communication systems. **(6 Marks)**

7. (a) Derive an expression for the instantaneous value of an AM signal in terms of carrier and side band frequencies. **(8 Marks)**

(b) Carryout the following conversion

i) $(F9AC \cdot 5D8B)_{16} = (?)_{10}$

ii) $(457 \cdot 245)_8 = (?)_{10}$ **(6 Marks)**

(c) Carryout subtraction using :

i) 1's complement for $(101101 - 11001)_2$

ii) 2's complement for $(11001 - 101101)_2$. **(6 Marks)**

8. (a) Explain the operation of a two input TTL NAND gate using a neat circuit diagram. **(8 Marks)**

(b) With truth table explain how a $R - S$ flip flop can be realised using NOR gates. **(6 Marks)**

(c) Show how amplitude, frequency and phase can be measured using a CRO. **(6 Marks)**

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